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XXX.—*On the former Existence of a large Pelican in the English Fens.* By ALPHONSE MILNE-EDWARDS*.

THE Mammals whose remains we find in peat-bogs have been the object of careful study; and we begin to know well several representatives of that fauna with which man, at his origin, probably had to do. On the other hand we know very little of the Birds which have left their remains in these deposits, and hitherto a precise determination of them has not been attempted. There would be, however, a great interest in undertaking this examination, and in ascertaining what were the species of this class which inhabited our countries at the period when the Beaver, the Urus, the Bison, and the Irish Elk lived in great numbers in the forests and on the borders of our watercourses. I have lately convinced myself that investigations of this kind would give important results.

The peat-bogs of the neighbourhood of Cambridge have furnished a pretty large number of remains of Birds, which Mr. Seeley and Mr. Alfred Newton have been good enough to submit

* [We have thought that a translation of this article (which appears in the 'Annales des Sciences Naturelles,' 5^{me} sér. tom. viii. pp. 285-293, pl. 14) would be interesting to very many of our readers, who might otherwise not become acquainted with it. The specimen was exhibited at the Meeting of the Zoological Society of London, on the 9th of January last (cf. P. Z. S. 1868, p. 2).—ED.]

to my examination. I have been struck at finding among them a humerus which evidently proceeded from a Pelican.

This bone, which belongs to the Woodwardian Museum, was obtained from the peat-bogs of the marshy districts, the Fenlands, which cover the northern part of Cambridgeshire. These deposits have been studied with much care by Mr. Seeley*, who with his usual kindness has furnished me with some valuable information on the subject.

Beneath the peat in course of formation, which is of variable thickness, and contains some freshwater shells as well as living plants, there lies a clay filled in places with marine shells such as *Tellina obliqua*, *Cardium edule*, and *Scrobicularia piperita*, and enclosing also some remains of marine mammals, such as the Walrus, Porpoise, and Whale. This clay rests on a bed of peat in which occur trunks of yew-trees (*Taxus baccata*), some placed vertically and reaching to the surface of the peat, but rotted off in the clay above. This is the deposit in which the remains of land-vertebrates are found; and, though the exact position whence the Pelican's humerus was obtained was not noted, its colour and nature indicate that it came from this layer of peat. The mammals which have been recognized from the same layer belong to the following species:—*Bos frontosus*, *B. primigenius*, *Cervus megaceros*, *C. elaphus*, *C. capreolus*, *Ursus arctos*, *Lutra vulgaris*, *Canis lupus*, *Sus scrofa*, and *Castor europæus*. I have also been able to recognize several species of birds, such as the Whooper-Swan (*Cygnus ferus*), Wild Duck (*Anas boschas*), Garganey (*A. querquedula*), Crested Grebe (*Podiceps cristatus*), Bittern (*Ardea stellaris*), and Coot (*Fulica atra*).

The remains of Swans were very numerous there, and belonged to many individuals. Among them occur fragments of the sternum with the deep cavity which, in this species, lodges the fold of the wind-pipe. Bones of the Grebe also were sufficiently common, though there were but few coming from the Duck, the Bittern, or the Coot. All these species still dwell numerously in the eastern part of England; their presence, therefore, in its peat-bogs has nothing in it which can surprize us: but with the

* "Theoretical Remarks on the Gravel and Drift of the Fenlands." Geol. Mag. 1868, iii. p. 495.

Pelican it is otherwise ; for this bird does not belong to the fauna of the British Islands.

The genus *Pelicanus* counts several species, which for the most part inhabit the warm regions of the globe. *Pelicanus rufescens*, Gmel., is a native of Africa, where it is met with from the Gulf of Guinea to the Mozambique Channel ; *P. philippensis*, Gmel., inhabits the southern parts of Asia and the Philippine Islands ; *P. trachyrhynchus*, Lath., is found in South America, as is also *P. fuscus* and *P. thagus* ; *P. conspicillatus*, Temm., is an Australian species. This genus in Europe is only represented by two specific forms—*P. crispus*, Bruch, which is met with on the shores of the Black Sea and on the islands at the mouth of the Danube, and *P. onocrotalus*, Linn., which is common in the southern and eastern countries of Europe. This last occurs in large numbers on the lakes and watercourses of Hungary and Russia, and is also seen further south in Asia and in Northern Africa. If it occurs in France, it is only accidentally ; and only two or three exceptional cases are recorded in which its presence has been asserted in England. Thus Fleming, in his 'History of British Animals,' tells us that a Pelican was killed in 1663 in Horsey Fen*, and that another of these birds, in brown plumage, was seen by Dr. Leith in the month of May at Blackheath, near London ; and, finally, Mr. Alfred Newton has shown me a note published by Mr. Tristram [Zool. 1856, p. 5321] in which that author announces that the remains of a Pelican were found on the shore at Castle Eden, in the county of Durham, the 25th August, 1856.

Pelicans, then, cannot figure in the list of birds proper to the British Islands ; for the few individuals there met with have been driven by the winds far from the countries which they commonly inhabit. But one cannot explain in that manner the existence

* [This statement, which rests on the authority of Sir Thomas Browne, was, we believe, together with that which next follows it in the text, first published by Latham (Synops. B. iii. p. 577) in 1785. Sir Thomas inquires whether the Horsey bird might not have been one of the King's Pelicans, lost about that time from St. James's Park. Montagu (Suppl. Orn. Diet.) suggests that the bird seen by Dr. Leith may have been an immature Swan.—ED.]

of our Pelican in the peat-bogs of the neighbourhood of Cambridge; for it belongs to a young bird, consequently too weak to undertake distant voyages. It is sufficient to cast a glance on the bone of which I am giving the history, to be assured that the process of ossification was not completed, as is shown by the state of the articular extremities. One must not for a single moment think that this bird had left Russia or Africa and, driven from its course by atmospheric currents, come to die in England, on the borders of the Fens, where the beds of peat in which it was found are deposited. One must not invoke such an explanation; and evidently this Pelican was a native of that country.

We may be inclined perhaps to wonder that a single bone, belonging to a young animal, and consequently not presenting all its anatomical characters, should permit the exact recognition of the genus and species of bird to which it belongs. So precise a determination would not be always possible; but in the present case there need be no doubt; for I have shown, in another work*, that the wing-bone in the genus *Pelicanus* offers extremely clear distinctive peculiarities, which do not allow of its being confounded with that of any other bird.

The length of the bone furnishes a character which should not be neglected; for there is no other bird of flight, except the Albatros, which has the humerus so long; and in this last genus its characters are otherwise clearly different. Indeed this bone is very slender, and its articular extremities are much compressed. Besides, above the epicondyle there is a hook-shaped apophysis to which is attached the long extensor muscle of the manus. In the Pelican, on the contrary, the humerus is stout, relatively to its length, its articular extremities are bent back, and there is no upper epicondylia apophysis.

All other birds have the wing-bone much smaller than the Pelicans; and even if we dismiss this empiric character, we find in the conformation of the bone fundamental differences which permit of its easy recognition. Notwithstanding its bulk it is extremely light, which is due to the development of the internal air-cells, which open by a large orifice situated at the upper extremity beneath the trochanterian tuberosity. The bony tissue

* [Oiseaux fossiles de la France, p. 230.—Ed.]

of the diaphysis is extremely dense and firm, but presenting very little thickness. The articular extremity is tolerably expanded, and remarkable for the slight projection of the external ridge to which the great pectoral muscle is attached, and also for the bending back of the surface on which the short portion of the biceps works. In no other bird is this surface nearly so much developed; for in the present genus it forms a considerable projection which extends beyond the surface of the bone and the inner edge; below it is terminated by a groove very deep and peculiar to the Pelican. The external ridge, as I have just said, projects but little; and one might wonder at the fact in a bird which flies so well, if it did not terminate in a large, somewhat oval and rough impression, which offers a very extended surface of insertion for all the lower portion of the principal pronator muscle of the wing. Inside this ridge we see a slight depression, bounded beneath and on the sides by a curved and somewhat projecting line; and this surface is occupied by the anterior deltoid muscle, which is extremely large. The articular head of the bone is much extended transversely, but only a little elevated.

The shaft of the bone presents a curve inwardly concave; it is furrowed beneath and in front of a somewhat oval, and not very deep, depression for the insertion of the anterior brachial muscle. The canal by which the bone is nourished opens upon the inner edge a little above the half of the diaphysis.

The inferior articular extremity is remarkably thick; of its two condyles the cubital is most developed, and above it are some pneumatic orifices. The epicondylar projection is thick, rounded, and clearly separated from the radial condyle. Traces only of the olecranian fossa exist; and, finally, the lip which inwardly bounds the inner groove of the triceps, is extremely bent back and thick.

The pneumaticity of the humerus and the bulk of the diaphysis, compared with that of its extremities, do not allow of this bone being confounded with its analogue among the Swans or the other lamellirostral *Palmipedes*. The bending back of the bicapital surface and the slight thickness of the bony plate differentiate it from that of the other *Totipalmes*, such as the Gannets, Cormorants, and the like.

The absence of an upper epicondylar hook-shaped apophysis will not allow of its being confounded with the wing-bone of the long-winged *Palmipedes*, and with the Waders which I place in the family of Sandpipers. Among the largest representatives of the family of Storks, such as the Marabous, the principal bone of the wing resembles that of the Pelican in its pneumaticity and in the development of the bicipital surface; but the diaphysis is comparatively much less stout, the external ridge more prominent, the trochanter more projecting, and the epitrochlear stouter and furrowed by deep grooves for the insertion of the flexor muscles of the manus; lastly, in these birds the inner lip of the groove of the triceps is only slightly bent back.

In the Cranes the humerus is more strongly bowed, and the bicipital surface is relatively only slightly bent back. I should add that the epitrochlear is much more developed.

The differences which exist between the wing-bone of the gallinaceous and passerine birds and the Parrots and that of the Pelicans are too striking and too numerous for it to be useful to pause upon them. In the natural group formed by the birds of prey, the shaft of the bone is generally slightly bent back, though the extremities are much expanded and the bicipital surface only occupies a small space. In the Condor, however, as in all large birds of flight, the humerus is very pneumatic and presents numerous air-orifices above the lower condyles and below the great trochanter; but the bony plate of the diaphysis is very thick, the outer ridge is prolonged nearly as far as half the bone, and, lastly, the lower extremity is remarkably expanded. Besides, the locality of this species would have enabled me to dispense with the comparison of its skeleton with that of the Pelican; but I think it well to show that, in this last genus, the humerus offers a combination of organic characters which are not elsewhere found.

This examination proves on the strongest evidence that the fossil bone of the Cambridgeshire peat-bogs belongs to the genus *Pelicanus*; for, although its articular extremities are only imperfectly ossified, all the characters are to be found there which I have shown to be proper to the Pelicans:—the slight projection of the insertional ridge of the great pectoral muscle and the

rough impression situated beneath it; the extent of the depressed surface where the anterior deltoid is lodged; the position of the canal for nourishing the bone; the number and the size of the pneumatic orifices, and so forth. The agreement of the proportions between the shaft of the bone and its extremities is the same; and the light specific weight of which I have above spoken is equally to be found. We cannot judge of the extent of the bicipital surface; for this last is unfortunately broken. Besides, that we may better estimate the resemblance between this bone and the humerus of the Pelican, I have had one of these bones drawn*.

The single fact of the presence of a Pelican in the Cambridgeshire peat-bogs is of real interest; but the study I have made of the fossil bone in question gives something more. It presents, indeed, very considerable dimensions. I have already had occasion to say that its articular extremities are imperfect; consequently it is not in its entirety, and evidently by the progress of age it would become decidedly elongated. However that may be, it measures about 37 *centimètres* [14·25 inches]. Knowing the length of the humerus, we may easily deduce from it the length of the whole wing; for, in the Pelicans, the proportions of the different bones which form the solid frame-work of the fore limb vary but very little. Thus, if we suppose the length of the humerus in these birds to be represented by 100, that of the forearm would be 113, and that of the manus 78. Consequently, allowing that in our Pelican of the peat-bogs the proportion was the same, the forearm would have measured 42 *centimètres*, and the manus 29, which brings the whole length of the wing without its feathers to 1·8 *mètre* [about 3 feet 6 inches].

I have compared the fossil of the Cambridgeshire fens with many humeri of adult Pelicans belonging to different species, such as *P. onocrotalus*, *P. crispus*, *P. philippensis*, and *P. thagus*, and I have not met with a single one of which the dimensions were the same. The largest of *P. onocrotalus* hardly approach it. Are we, then, to regard the bird of the peat-bogs as a dis-

* [We are compelled to omit a reproduction of the plate, which gives two views of the Cambridgeshire bone and one of the humerus of the recent *Pelicanus onocrotalus*—all of the natural size.—ED.]

inct species of much more considerable size? This supposition is probable enough; but it would be perhaps premature to establish at the present time a new specific form; and before inscribing it in our systematic catalogues, it seems to me more prudent to wait till new researches shall have produced some parts of the skeleton belonging to adult birds, which will inform us more exactly as to the proportions of our British Pelican.

We know at what geological epoch most of the mammals whose remains are found buried in the drift have appeared; we know also the epoch at which some of them have ceased to exist. With birds it is unfortunately not thus; the materials of study we have at our disposal are not yet sufficient to let us reconstruct the entire history of the species of which we can determine the history during the "quaternary" period. Has the ornithological population of this epoch, contemporary with the first ages of man, having been submitted to the same influences as the mammalian fauna, undergone analogous modifications? The little we at present know of it inclines to make us think so; for we know that at the epoch when the caves were filled up many of our birds already existed in large numbers. Others, such as the Snowy Owl (*Nyctea nivea*) and the Willow-Grouse (*Tetrao albus*), have gradually retired towards the north; others, again, have at last disappeared, as proved by the remains of the large Crane discovered in the caves of the Dordogne*. The remains collected in the peat-bogs of Cambridgeshire seem to indicate facts of the same order; for by the side of the Swan, the Duck, the Grebe, the Bittern, and the Coot we find a Pelican of gigantic stature, which seems to belong to a species different from those which represent this genus in our actual fauna, and has lived in England along with the Great Irish Elk, the Urus, and perhaps even with the Tichorhine Rhinoceros.

XXXI.—Notes on Various Indian Birds.

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[Continued from p. 181.]

772. *CROCOPUS PHENICOPTERUS*. Bengal Green Pigeon.

I found this species tolerably abundant in the Maunbhoom

* [Cf. Ibis, 1866, p. 414.—ED.]